

## Patent Abstracts of Japan

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PUBLICATION DATE : 13-04-99

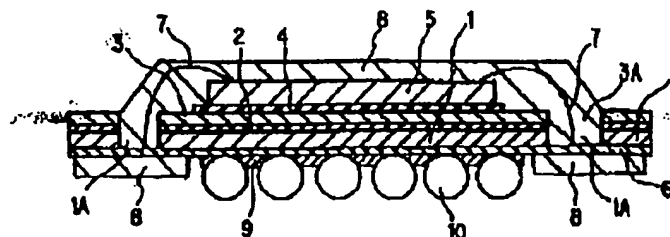
APPLICATION DATE : 26-09-97  
APPLICATION NUMBER : 09262520

APPLICANT : HITACHI CABLE LTD;

INVENTOR : YONEMOTO TAKAHARU;

INT.CL. : H01L 23/12 // H01L 21/60

TITLE : BGA SEMICONDUCTOR DEVICE



**ABSTRACT :** PROBLEM TO BE SOLVED: To enable a BGA semiconductor device to be lessened in material cost, improved in productivity, and stabilized in a wire bonding characteristic, by a method wherein a semiconductor device is fixed directly to a stiffener, and an outer hole is provided to the insulating tape of a TAB tape and the stiffener to make a copper foil circuit pattern exposed.

**SOLUTION:** A polyimide tape 1 is provided with an outer hole 1A, and a stiffener 3 is possessed of an outer hole 3A. Therefore, a copper foil circuit pattern 6 is exposed at the outer holes 1A and 3A on a semiconductor device side. The pads of a semiconductor device 5 are connected to the copper foil circuit pattern 6 with bonding wires 7 through the outer holes 3A and 1A, and the semiconductor device 5 and the outer holes 3A and 1A are sealed up with a molding resin 8 enveloping the bonding wires 7. Furthermore, a part of the copper foil circuit pattern 6 opposite to the outer holes 3A and 1A is sealed up with the molding resin 8 to be reinforced.

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# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-102989  
(43)Date of publication of application : 13. 04. 1999

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(51)Int. CI. . H01L 23/12

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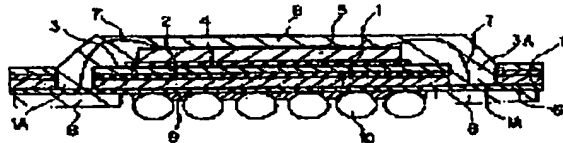
(21)Application number : 09-262520 (71)Applicant : HITACHI  
CABLE LTD  
(22)Date of filing : 26. 09. 1997 (72)Inventor : OTAKA  
TATSUYA  
YOSHIOKA  
OSAMU  
MURAKAMI  
HAJIME  
ONDA MAMORU  
YONEMOTO  
TAKAHARU

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## (54) BGA SEMICONDUCTOR DEVICE

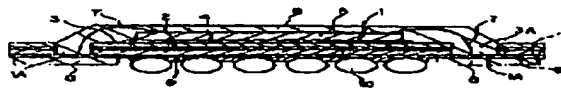
### (57)Abstract:

PROBLEM TO BE SOLVED: To enable a BGA semiconductor device to be lessened in material cost, improved in productivity, and stabilized in a wire bonding characteristic, by a method wherein a semiconductor device is fixed directly to a stiffener, and an outer hole is provided to the insulating tape



of a TAB tape and the stiffener to make a copper foil circuit pattern exposed.

SOLUTION: A polyimide tape 1 is provided with an outer hole 1A, and a stiffener 3 is possessed of an outer hole 3A. Therefore, a copper foil circuit pattern 6 is exposed at the outer holes 1A and 3A on a semiconductor device side. The pads of a semiconductor device 5 are connected to the copper foil circuit pattern 6 with bonding wires 7 through the outer holes 3A and 1A, and the semiconductor device 5 and the outer holes 3A and 1A are sealed up with a molding resin 8 enveloping the bonding wires 7. Furthermore, a part of the copper foil circuit pattern 6 opposite to the outer holes 3A and 1A is sealed up with the molding resin 8 to be reinforced.



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#### LEGAL STATUS

[Date of request for examination] 19. 10. 2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal  
against examiner's decision of  
rejection]

[Date of extinction of right]

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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** A solder ball is arranged in the shape of an array on the copper foil circuit pattern formed in one side of an insulating tape. In the BGA type semiconductor device which fixed the semiconductor device on the aforementioned stiffener while the aforementioned insulating tape was alike on the other hand and pasting up the stiffener for reinforcement, and connected the copper foil circuit pattern with the aforementioned semiconductor device by the bonding wire. While pasting up the aforementioned stiffener on the field besides the above of the aforementioned insulating tape directly through adhesives, it has an outer hole in a position. the aforementioned insulating tape. It has the outer hole which exposes the aforementioned copper foil circuit pattern to the position corresponding to the aforementioned outer hole of the aforementioned stiffener in a field besides the above. the aforementioned bonding wire. The BGA type semiconductor device characterized by having the composition which connects the aforementioned copper foil circuit pattern with the aforementioned semiconductor device through the aforementioned outer hole of the aforementioned stiffener, and the aforementioned outer hole of the aforementioned insulating tape.

**[Claim 2]** The aforementioned stiffener is the BGA type semiconductor device of composition of that the predetermined field which includes the inner circumference edge of the aforementioned outer hole at least is insulated according to claim 1.

**[Claim 3]** It is the BGA type semiconductor device of composition of that the thickness of the aforementioned insulating tape is a polyimide tape 100 micrometers or less, and thickness has pasted up the aforementioned copper foil circuit pattern on the aforementioned insulating tape by the thermosetting

adhesive 35 micrometers or less while it has the thickness of 35 micrometers or less according to claim 1.

[Claim 4] For softening temperature, thickness is [ the aforementioned stiffener ] the BGA type semiconductor device of composition of having pasted the aforementioned insulating tape by the thermoplastic adhesive 250 degrees C or less according to claim 1 at 50 micrometers or less.

[Claim 5] The aforementioned stiffener is the BGA type semiconductor device of composition of that thickness has pasted the aforementioned insulating tape by the thermosetting adhesive 50 micrometers or less according to claim 1.

[Claim 6] The aforementioned stiffener is the BGA type semiconductor device of composition of that the bonding wire connects with the ground potential according to claim 1.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] Especially this invention relates to a BGA type semiconductor device with the stiffener with which a TAB tape is reinforced about a BGA (Ball Grid Array) type semiconductor device.

[0002]

[Description of the Prior Art] The demand of the BGA type semiconductor device which has arranged the solder ball which functions as a lead for I/O connected to an external circuit in the shape of an array is increasing with increase of the number of in-and-out force of an LSI element in recent years.

[0003] Drawing 15 shows the conventional BGA type semiconductor device. This BGA type semiconductor device aims at a cost cut by using the TAB tape which formed the copper foil circuit pattern 6 in one side of the polyimide tape 1. on the other hand, the polyimide tape 1 is boiled, the stiffener 18 is stuck through the film 17 with double-sided adhesives, and the semiconductor device 5 has fixed the stiffener 18 through adhesives 4. The pad (not shown) of a semiconductor device 5 is connected to the copper foil circuit pattern 6 by the bonding wire 7, and the copper foil circuit pattern 6 is connected to the solder ball 10, being protected by the solder resist 9. The connection with the bonding wire 7 of a semiconductor device 5 and the copper foil circuit pattern 6 is closed with the mould resin 8.

[0004]

[Problem(s) to be Solved by the Invention] However, since according to the conventional BGA type semiconductor device 2 times of attachment processes, attachment of a tape with double-sided adhesives and attachment of a stiffener, are needed when sticking a stiffener, Since productivity falls and the tape with double-sided adhesives is used, the cost of materials becomes size, and further, in

order to perform wirebonding to the copper foil circuit pattern pasted up on the polyimide tape with adhesives, wirebonding nature is sharply influenced by the property of adhesives. Therefore, it is in the purpose of this invention offering the BGA type semiconductor device by which made productivity high, and fell the cost of materials, and wirebonding nature was stabilized.

[0005]

[Means for Solving the Problem] this invention arranges a solder ball in the shape of an array on the copper foil circuit pattern formed in one side of an insulating tape in order to realize the above-mentioned purpose. In the BGA type semiconductor device which fixed the semiconductor device on the aforementioned stiffener while the aforementioned insulating tape was alike on the other hand and pasting up the stiffener for reinforcement, and connected the copper foil circuit pattern with the aforementioned semiconductor device by the bonding wire While pasting up the aforementioned stiffener on the field besides the above of the aforementioned insulating tape directly through adhesives, it has an outer hole in a position. the aforementioned insulating tape It has the outer hole which exposes the aforementioned copper foil circuit pattern to the position corresponding to the aforementioned outer hole of the aforementioned stiffener in a field besides the above. the aforementioned bonding wire The BGA type semiconductor device characterized by having the composition which connects the aforementioned copper foil circuit pattern with the aforementioned semiconductor device through the aforementioned outer hole of the aforementioned stiffener and the aforementioned outer hole of the aforementioned insulating tape is offered.

[0006] In the BGA type semiconductor device of this invention, the predetermined field where a stiffener includes the inner circumference edge of an outer hole at least may be insulated, and thickness of an insulating tape is a polyimide tape 100 micrometers or less, and thickness has pasted up a copper foil circuit pattern on the insulating tape by the thermosetting adhesive 35 micrometers or less while it has the thickness of 35 micrometers or less. Furthermore, softening temperature has pasted [ thickness ] the aforementioned insulating tape by the thermoplastic adhesive 250 degrees C or less by 50 micrometers or less, or thickness has pasted the insulating tape by the thermosetting adhesive 50 micrometers or less, and, in a certain case, the stiffener is connected by the bonding wire at the ground potential.

[0007]

[Embodiments of the Invention] Hereafter, the form of the BGA type semiconductor device of this invention is explained in detail. Drawing 1 shows the form of operation of the BGA type semiconductor device of this invention.



The polyimide film 1 with a thickness of 50 micrometers or less (for example, thing currently sold with the tradename of "you PIREKKUSU"), The copper foil circuit pattern 6 pasted up on one side of the polyimide film 1 by the thermosetting adhesive, with the stiffener 3 which the polyimide film 1 boiled on the other hand, and has been pasted up by the polyimide system thermoplastic adhesive 2 It has the semiconductor device 5 pasted up on the stiffener 3 with adhesives 4, the solder ball 10 connected to the copper foil circuit pattern 6 protected by the solder resist 9, and the mould resin 8 which closes and reinforces a predetermined portion.

[0008] The polyimide tape 1 had outer hole 1A, and the stiffener 3 had outer hole 3A, and it has exposed the copper foil circuit pattern 6 in the portion by this at the semiconductor device 5 side. The pad (not shown) of a semiconductor device 5 is connected with the copper foil circuit pattern 6 through the outer holes 3A and 1A by the bonding wire 7, and a semiconductor device 5 and the outer holes 3A and 1A are closed by the mould resin 8 by the form which encloses a bonding wire 7. The opposite side of the outer holes 3A and 1A is also given to the copper foil circuit pattern 6, and the mould resin 8 has reinforced this portion of the copper foil circuit pattern 6.

[0009] Drawing 2 shows the structure where the copper foil circuit pattern 6 is connected with pad 5A of a semiconductor device 5 by the bonding wire 7 through outer hole 3A of a stiffener 3.

[0010] Drawing 11 shows the manufacturing process of the BGA type semiconductor device of this invention from drawing 3 . [ Drawing 3 ] Prepare what unified two or more stiffeners 3 which have outer hole 3A by outer frame 3B. outer frame 3B -- the hole for conveyance -- it has 3C If this outer frame 3B is used as the same pattern as the usual leadframe, after treatment, such as fixing of the processing, for example, the application of adhesives, after sticking on a TAB tape, wirebonding, the mould of a resin, and a solder ball, can be performed using the after-treatment equipment of a leadframe.

[0011] [ Drawing 4 ] Prepare a TAB tape. softening temperature with a thickness of 20 micrometers which the polyimide tape 1 looked the TAB tape like [ SLP copper foil 6 with a thickness of 18 micrometers pasted up on the polyimide tape (you PIREKKUSU) 1 with a thickness of 50 micrometers and its one side through the thermosetting adhesive (not shown) with a thickness of 25 micrometers ] on the other hand, and was formed is constituted by the polyimide system thermoplastic adhesive (or thermosetting adhesive) 2 250 degrees C or less SLP copper foil 6 is used as the copper foil circuit pattern 6 through the usual TAB process. As for the copper foil circuit pattern 6, Pb, Ag, or Au is galvanized

on a front face. this TAB tape forms outer hole 1A by punching -- having -- moreover, the hole for conveyance -- 1B is formed

[0012] [ Drawing 5 ] Carry out alignment of the TAB tape of drawing 4 to the stiffener 3 shown in drawing 3 .

[0013] [ Drawing 6 ] Through a thermoplastic adhesive 2, paste up a TAB tape on a stiffener 3 and unite with it, after carrying out alignment by drawing 5 .

[0014] [ Drawing 7 ] Apply or stick the solder resist 9 of a predetermined configuration before carrying the solder ball 10 in the predetermined field of the copper foil circuit pattern 6 at a next process.

[0015] [ Drawing 8 ] Apply adhesives 4 on a stiffener 3 and fix a semiconductor device 5 to a stiffener 3.

[0016] [ Drawing 9 ] Contact the heater 11 for wirebonding heating into the portion of the copper foil circuit pattern 6 corresponding to outer hole 1A of the polyimide tape 1, and outer hole 3A of a stiffener 3 directly. Next, the outer holes 3A and 1A are milled, and the pad (5A of drawing 2 ) and the copper foil circuit pattern 6 of a semiconductor device 5 are connected by the bonding wire 7.

[0017] [ drawing 10 ] the mould of the upper and lower sides of the whole after carrying out wirebonding -- load the interior of metal mold 12A and 12B, and pour in a mould resin from the resin injected hole 13 The arrow in drawing shows the flow of a mould resin.

[0018] [ Drawing 11 ] Mold omission is carried out through a cooling process after pouring of a mould resin. Next, the solder ball 10 is fixed to the copper foil circuit pattern 6. Finally, the garbage of a stiffener 3 is excised. Consequently, it becomes the BGA type semiconductor device shown in drawing 1 .

[0019] Drawing 12 shows the place which is contacting the electrical property check probe 15 to the copper foil circuit pattern 6 through the outer holes 3A and 1A in the state before completion. By this, the electrical property of semiconductor device 5 grade can be checked.

[0020] Drawing 13 shows the gestalt of other operations of the BGA type semiconductor device of this invention, and has the composition which makes a stiffener 3 a ground potential by bonding wire 7A. In this case, it is desirable to cover the outcrop of a stiffener 3 with an insulator and to make it a bonding wire 7 not ground.

[0021] Drawing 14 shows the gestalt of other operations of the BGA type semiconductor device of this invention, and has the composition which formed the pre-insulation 16, such as a polyimide varnish, in the edge of a stiffener 3. A possibility that a bonding wire 7 may short-circuit is avoidable with this. This

composition is desirable although the BGA type semiconductor device of this invention is mass-produced stably.

[0022]

[Effect of the Invention] Since productivity can be raised, and an outer hole is established in the insulating tape and stiffener of a TAB tape and it was made to expose a copper foil circuit pattern while lowering the cost of materials according to the BGA type semiconductor device of this invention since a direct semiconductor device was fixed to a stiffener as explained above, the stable wirebonding nature can be obtained.

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**TECHNICAL FIELD**

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[The technical field to which invention belongs] Especially this invention relates to a BGA type semiconductor device with the stiffener with which a TAB tape is reinforced about a BGA (Ball Grid Array) type semiconductor device.

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**PRIOR ART**

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Since productivity can be raised, and an outer hole is established in the insulating tape and stiffener of a TAB tape and it was made to expose a copper foil circuit pattern while lowering the cost of materials according to the BGA type semiconductor device of this invention since a direct semiconductor device was fixed to a stiffener as explained above, the stable wirebonding nature can be obtained.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, since according to the conventional BGA type semiconductor device 2 times of attachment processes, attachment of a tape with double-sided adhesives and attachment of a stiffener, are needed when sticking a stiffener, Since productivity falls and the tape with double-sided adhesives is used, the cost of materials becomes size, and further, in order to perform wirebonding to the copper foil circuit pattern pasted up on the polyimide tape with adhesives, wirebonding nature is sharply influenced by the property of adhesives. Therefore, it is in the purpose of this invention offering the BGA type semiconductor device by which made productivity high, and fell the cost of materials, and wirebonding nature was stabilized.

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## MEANS

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** The cross section showing the gestalt of operation of the BGA type semiconductor device of this invention.

**[Drawing 2]** The plan showing the gestalt of operation of the BGA type semiconductor device of this invention.

**[Drawing 3]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 4]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 5]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 6]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 7]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 8]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 9]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 10]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 11]** The cross section showing the manufacturing process of the BGA type semiconductor device of this invention.

**[Drawing 12]** The cross section showing the check of the electrical property before completion of the BGA type semiconductor device of this invention.

[Drawing 13] The cross section showing the gestalt of other operations of the BGA type semiconductor device of this invention.

[Drawing 14] The cross section showing the gestalt of other operations of the BGA type semiconductor device of this invention.

[Drawing 15] The cross section showing the conventional BGA type semiconductor device.

[Description of Notations]

1 Polyimide Tape

1A Outer hole

2 Thermoplastic Adhesive

3 Stiffener

3A Outer hole

4 Adhesives

5 Semiconductor Device

6 Copper Foil Circuit Pattern

7 Bonding Wire

8 Mould Resin

9 Solder Resist

10 Solder Ball

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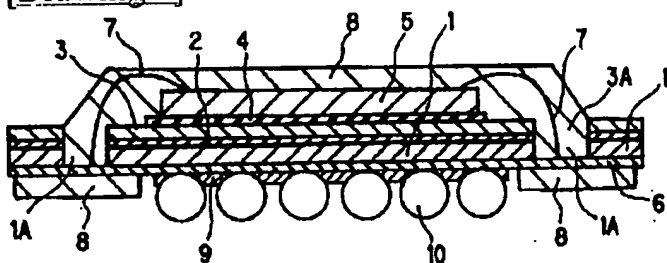
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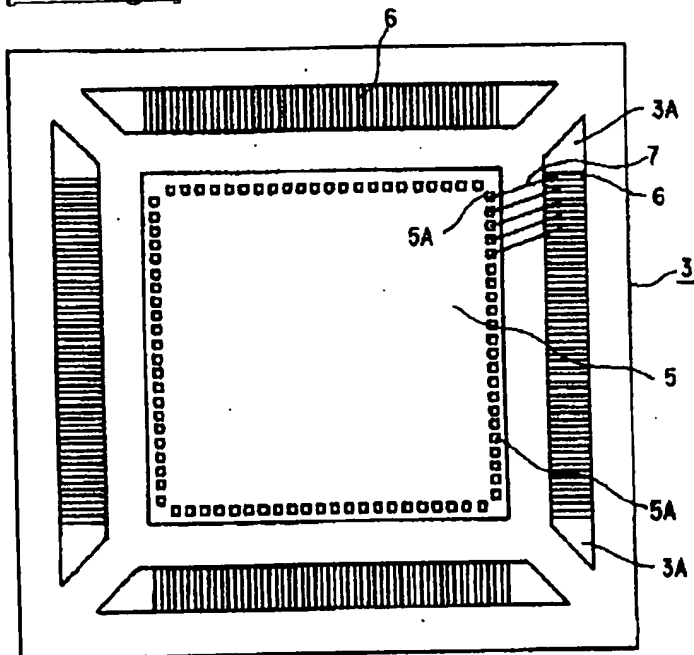
**DRAWINGS**

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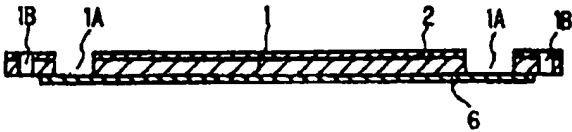
[Drawing 1]



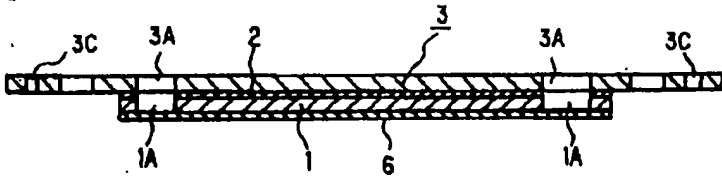
[Drawing 2]



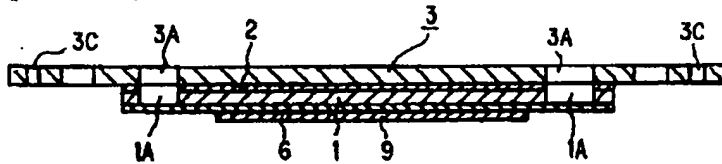
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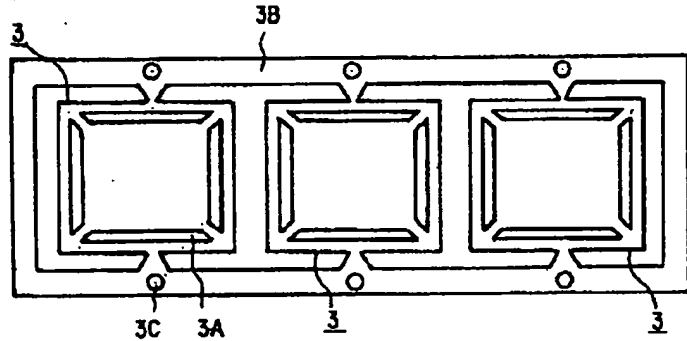
[Drawing 6]



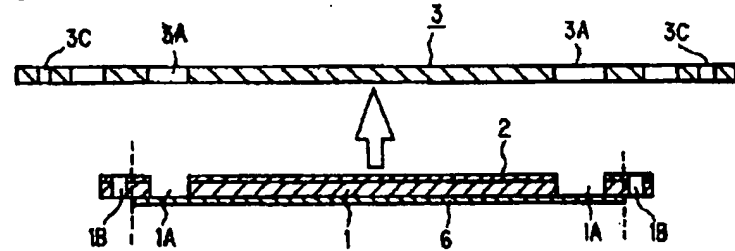
[Drawing 7]



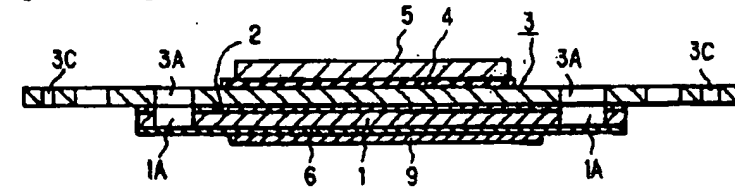
[Drawing 3]



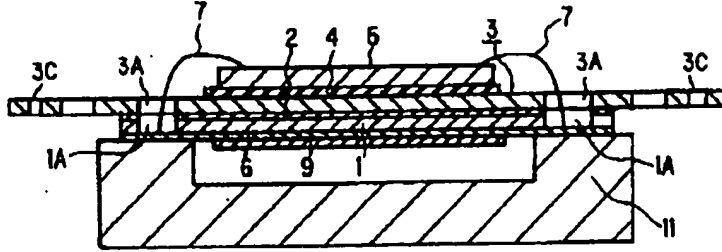
[Drawing 5]



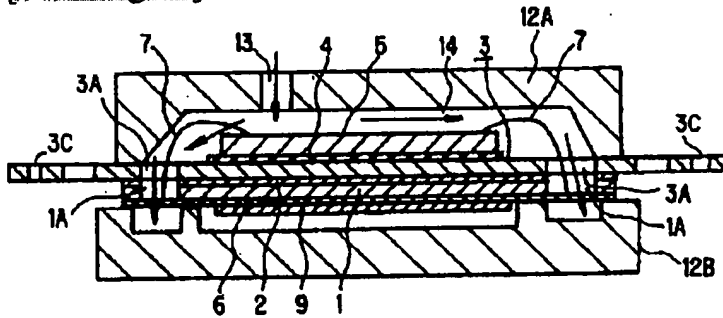
[Drawing 8]



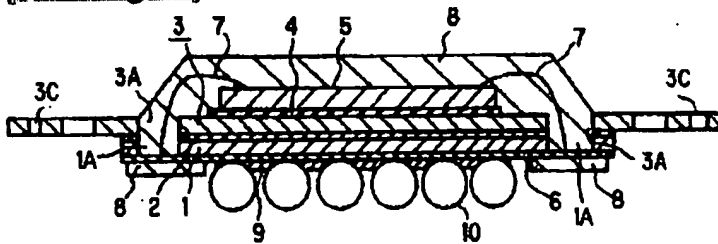
[Drawing 9]



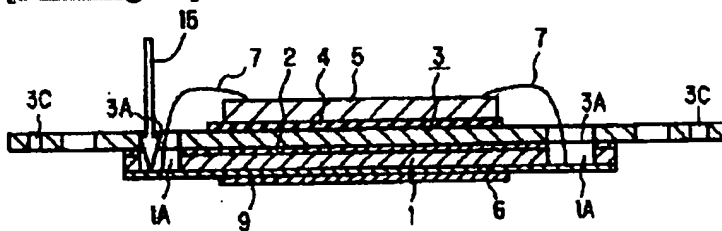
[Drawing 10]



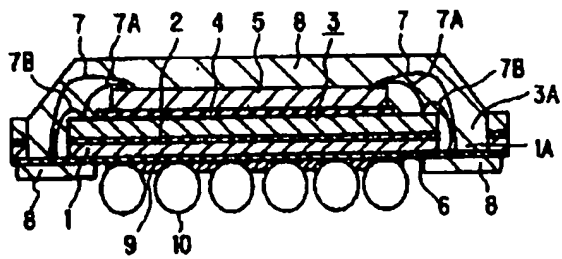
[Drawing 11]



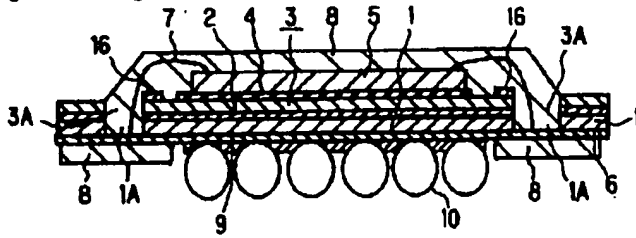
**[Drawing 12]**



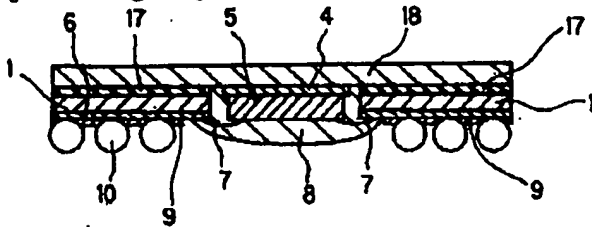
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]